REMARKS

Claims 1-33 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite. Claim 1 has been amended to obviate the Examiner's rejection.

Claims 1 has been rejected to as having insufficient antecedent basis. Claims 1 has been amended to obviate the Examiner's rejection.

Claim 1 has now been rejected under 35 U.S.C. §102(b) as being anticipated by Eckard, U.S. Patent No. 6,225,267.

The Examiner's rejection is respectfully traversed.

Claim 1 as now amended is directed to a metalworking fluid from heavy alkylate, comprising a residual fraction having C22 – C26 carbon atom of detergent class Alkyl Benzene in the concentration range of 40 to 85.68 weight percent of the metal working fluid, and at least one sulfonate/oleate class emulsifier in the range of 10 to 37.98 weight percent of the metalworking fluid. A metalworking fluid from heavy alkylate, also comprising at least one additive pack having synergistic combination of various additive components including, at least one triglyceride vegetable oil type lubricity booster component in the concentration range of 2-10 weight percent of metal working fluid, a phenol/amine type antioxidant component in the concentration range of 0.005-0.05 weight percent, a phenolic fungicide component in the concentration range of 0.005-0.05 weight percent, an organic sulfide/phosphosulfide extreme pressure additive component in the concentration range of 0.005-0.05 weight percent, and a triazole/sulfonate type antirust component in the concentration range of 0.005-0.05 weight percent. A metalworking fluid from heavy alkylate, also comprising an alcoholic co-surfactant component in the range of 1-10 weight percent of metal working fluid and a sulfonate/sulfate coupling agent in the range of 0.5 to 1.0 weight percent of metal working fluid. A

metalworking fluid from heavy alkylate, also comprising alkali earth metal salt component in the range of 0.5-1.0 weight percent of metal working fluid when converted into emulsion by stirring it in 60 to 90 weight percent of water then the emulsion is useful as general purpose soluble cutting oil to act as a coolant/engineering aid in metalworking, having less toxicity than mineral oil based metalworking fluid and adding value to a waste product, i.e. heavy alkyl benzene.

Eckard, U.S. Patent No. 6,225,267 is directed to an emulsifier, which is a blend of natural petroleum sulfonate, alkyl benzene sulfonate, dodecyl benzene sulfonate and other type of sulfonate including alkyl sulfonate. Natural petroleum sulfonate contains alkylbenzene sulfonate but it is not only alkyl benzene sulfonate, e.g., heterocyclic sulfonates are also part of natural sulfonates. Characteristics and the effects of blended sulfonate are different from single alkyl benzene sulfonate. All alkyl benzenes are not the same in structure or in properties. Eckard has not disclosed any metalworking fluid composition from heavy alkyl benzene. The Applicants' invention, does not use Eckard's blended sulfonate or alkyl benzene and a natural petroleum sulfonate blend is not used. The Applicants have used heavy alkyl benzene sulfonate or oleate or their blend for emulsifier. Thus, the Applicants' invention is not anticipated by Eckard.

It is a well known fact that water is a universal coolant and sulfonate act as anti-corrosion additive. The heavy alkyl benzene along with water and heavy alkyl benzene sulfonate not only acts as a coolant but also acts as a lubricant for two rubbing metal surfaces and carriers of different additives in which additive portion are responsible for improving various properties of metal working fluid. The improved properties include oxidation stability, extreme pressure tolerance and lubricity properties of heavy alkyl benzene, checking the

growth of bacteria in the metalworking fluid in presence of water and helps in removing the metal turnings/chips from cutting point.

Eckerd '267 describes the use of alkyl aryl sulfonate (a class) as an emulsifier. Heavy alkyl benzene sulfonate is one of the alkyl aryl sulfonates but it is not the same. For example, cetyl naphthalene sulfonate or tetradecyl anthracene sulphonate are also aryl alkyl sulfonate but are not alkyl benzene sulfonate. The heavy alkyl benzene sulfonate may or may not be present in the emulsifier of Eckard. If Eckard only wants to use the natural petroleum sulfonate as an emulsifier, heavy alkyl benzene is an optional component of the Applicants' invention and it is not the only component in the metalworking fluid composition. For example, when oleate is used, then the sulfonate component will be absent in the Applicants' invention.

Thus, the Applicants' invention is not anticipated by Eckerd '267.

Claims 1-12 and 34 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Anantaneni, U.S. Patent No. 6,630,430, in view of Boffa, U.S. Patent No. 5,804,537; Tanaka, U.S. Patent No. 6,245,725 B1; Camenzind, U.S. Patent No. 7,026,438 B2; Van Dam, U.S. Patent No. 6,784,142 B2; Matsushita, U.S. Patent No. 5,741,763; Zoch, U.S. Patent No. 3,902,868; and Otaki, U.S. Patent No. 4,765,917.

The Examiner's rejection is respectfully traversed.

The Applicants' invention is directed to a metalworking fluid/ soluble cutting oil from waste product heavy alkyl benzene. This invention was not taught or even suggested by a combination of any of the above prior art references.

The alkylating industries were searching for value addition/application for their waste product "heavy alkyl benzene". They were unable to find a use for the waste product. Not until the Applicants' invention has a use been discovered. Now only through hindsight, the

Examiner states that the invention is obvious and that is by combining eight different references.

There are structural difference between heavy alkyl benzene and other alkyl benzene. Due to the low viscosity index, oxidation stability and flow properties does not work as a lubricant. It has competition with mineral oil and synthetic oil.

The Applicants have spent around 20 years in the study of fractionation, structures, properties, etc. of heavy alkyl benzene. Sulfonates are highly oil soluble. On the basis of their 20 years of study, the Applicants have determined how to convert waste heavy alkyl benzene in to useful heavy alkyl benzene by tailoring the material. It is not an ordinary skill in art and has taken over 20 years to determine how to do so. To prepare oil-water stable emulsion from highly hydrophobic heavy alkyl benzene and its sulfonate is not an easy task. It requires great detail and has taken a very long time to find.

The main object of the present invention is to provide a process for metalworking fluids/soluble cutting oil from heavy alkylate. It also provides for a heavy alkylate based less toxic lubricant component for metalworking fluids/soluble cutting oil and a new application for the by-product heavy alkylate. Additionally, there is a new composition of metalworking fluid/soluble cutting oil for the benefit of metalworking and alkylate manufacturing industries. On the other hand, Anantaneni '430 is related to a composition of lubricating oil. The examples are directed to the synthesis of alkyl benzenes and to the concept of detergent, alkyl benzene and its derivatives. In the 2nd paragraph after examples, it is stated that:

> Although the present invention has been described largely in reference to the alkylation of benzene using olefins as an alkylating agent, it should be appreciated that substituted benzenes are also useful as starting materials within the context of the present invention, provided that the chemical groups appended to the benzene ring are not prohibitively de-activating of the benzene ring structure. In this regard, toluene is a

> functionally equivalent starting material, which may be used in place of all or part of the benzene employed. Other substituted benzenes such as xylene are also useful in this regard, as well as ethyl benzene, propylbenzene, and butylbenzene.

So, the patent is directed to the synthesis of alkyl benzene, whereas the Applicants' is on the composition of metalworking fluid, particularly soluble cutting oil and these are different.

Alkyl Benzene is a class or group of chemicals. All alkyl benzenes can not be same. Natural petroleum also contains alkyl benzene but petroleum can not be considered similar to alkyl benzene. Anantaneni '430 describes a particular type of alkyl benzenes, which are "2-phenyl" derivatives. 2-phenyl and benzene is not one compound. The Applicants' invention is related to heavy alkylate, a residue fraction of detergent class alkyl benzene. Detergent class alkyl benzene is chemically dodecyl benzene. It is produced by reacting propylene tetramer (dodecene) with benzene. Its residual fraction (heavy alkylate) is not restricted to 2-phenyl derivatives (such as decyl toluene or decyl 2-methyl benzene: di-alkyl benzene). So, both alkyl benzenes are different.

The Anantaneni '430 is directed to an "efficient detergent" whereas in the Applicants' invention is directed to "less toxic than mineral oil". Toxicity of mineral oil is due to its component of condense ring or poly-aromatic compound. Alkyl benzene is free from this toxicity and thus helps in reducing pollution and unhealthy mist hazards to operators. Anantaneni also teaches the method to produce di alkyl benzenes as opposed to the composition of soluble cutting oil (metalworking fluid) of the Applicants.

Anantaneni '430 patent does not describe the aqueous solution preparation of lubricants. The Applicants' invention describes aqueous solution/emulsion preparation and that stable emulsion is suitable for metalworking, i.e., cutting, drilling, milling, rubbing, etc.

The Anantaneni patent discloses a lubricating composition for a metal surface, especially an internal combustion engine. However, the patent is restricted to derivatives of 2-phenyl type of alkyl benzene (claim 1) "in which n may be any integer between 13 and 27, and in which R.sub.1, R.sub.2, R.sub.3, R.sub.4, and R.sub.5 are each independently selected from the group consisting of: hydrogen, a methyl group, an ethyl group, a propyl group, a butyl group, a sulfonic acid group, a sulfonate group, and a sulfonate ester group". There is no discussion of "fractionation" in Anantaneni. During synthesis, isolation is the typical practice but not fractionation. Fractionation is the usual practice for dividing a product into two or more useful products. In the Applicants' invention, "alkyl benzene" is the product of alkyl chain C12 or its multiple to the benzene. The residual fraction of this heavy alkylate is a mixture of similar alkyl benzene. On the other hand, the detergent of Anantaneni patent is restricted to use of sulfonate from 2-phenyl type of alkyl benzene while the Applicants' invention is directed to an emulsifier which is from heavy alkylate sulfonate or oleate. Use of oleate will also reduce the toxicity. Vegetable oil is also used in the Applicants' invention. In the Applicants' invention the aqueous emulsion from composition is useful for soluble cutting oil, however, it can not be useful for internal combustion engines as a lubricant. So, the two compositions and their uses are quite different.

The Anantaneni patent discloses composition comprised of alkyl benzene, having 18 to 30 carbon atoms, to enhance detergency (column 1, lines 20-25, 55-58). As per literature, sulfonate acts in different ways according to its structure and molecular weight. Sulfonate of lower molecular weight or di-sulfonate act as de-emulsifiers, sulfonate having molecular weight around 420-450 act as emulsifier, sulfonate of higher molecular weight act as industrial detergent/dispersant and sulfonate of highest molecular weight act as rust inhibitors or anti-

corrosion. All sulfonates are thus, not the same. If Anantaneni targeted "detergency" and the subject application targeted "emulsification" then the structure, degree of substitution and molecular weight range of sulfonate are different. In the Applicants' invention, the carbon range in the alkyl chain is suitable for emulsifier. Even carbon number overlaps, and the structures are different. When the components are different, it will leads to different compositions, which thus have different characteristics and properties.

In Anantaneni, the alkyl benzenes are present in the lubricating composition from 35 to 82 wt % of the total composition. That means the composition will be used in that ratio. In the subject application, originally alkyl benzenes are present in 40 to 85.68 wt %, however when they are emulsified in water they are in 10 to 40 % wt. The concentration of alkyl benzene will be from 4 to 8.568 (at 10 %) and 16 to 34.272 (at 40% in water). So, when in use, the compositions contain alkyl benzene are at quite different ratios.

Furthermore, Anantaneni '430 discloses the use of additives in the composition including extreme pressure additives, antioxidants and more (column 21, lines 38-45). But, Anantaneni does not specifically disclose the additives and the use of composition as an emulsion in water as general purpose cutting oil. For examples, he mentioned "anti-oxidant" but he does not specify which is being utilized. In the subject application, the additives are specified. For examples anti-oxidant is specified "an antioxidant component which is an alkyl phenol, aromatic amine or substituted alkyl phenol in concentration between 50 – 500 gm/liter, and further specified wherein the antioxidant component is an alkyl phenol or aromatic amine or substituted alkyl phenol selected from 2,6-ditertiary butyl phenol, 2,6-ditertiary p-cresol, Diphenylamine, Tertiary butyl phenol amino tetrazole and 2,6-dioctyl phenylene diamine. Thus even the additives are difference.

Additionally, for soluble cutting oil, the test for stability of emulsion as per ASTM methods or other standard method is needed and it is not mentioned by Anantaneni (US 6630430) patent however, it is discussed by the Applicants.

The Examiner states that Boffa, U.S. Patent No. 5,804,537 discloses a lubricating composition for an internal combustion engine comprised of alkylated sodium sulfonates from 5 to 80 wt percent (column 1, line 6-10; column 4, line 15 – 21; column 5, lines 18 – 21). Since Anantaneni discloses a lubricating composition for an internal combustion engine and Boff discloses that sodium sulfonate additives are advantageous in engine deposit performance, it would have been obvious for Anantaneni to also utilize this additive.

Boffa '537 uses the term "tri-metal detergent mixture" which is not a specific word. In fact Boffa uses overbased detergent mixture of a particular TBN for engine cleanliness. He does not specify the detergent being used. It may be petroleum sulfonate, alkyl aryl sulfonate, caboxylates, etc. (See para 4 of US 5804537). This paragraph is based on literature survey and patents 3150088, 3150089, 5232614, 4935576, 4982045, etc. Alkyl benzene sulfonate is not a finding of Boffa in US 5804537. It was previously known fact. Additionally, effect of overbased sufonates as mix detergent is not adopted by Anantaneni in patent. However, in the Applicants invention it is for soluble cutting oil and here sulfonate is efficient in water-oil emulsion formation, which is non-obvious in that patent. Furthermore, the alkyl benzene sulfonate used by the Applicants' is different from sulfonate used by Boffa or Anantaneni.

Boffa '537 uses overbased mixed detergent which may contain alkyl benzene sulfonate. The overbased detergent is useless in an aqueous media or anemulsion. In oil media, due to oxidation some organic acid forms and to neutralize those acids, overbased detergent or extra

alkali is needed as in the case of engine lubricants. But in aqueous media overbased detergent it is not necessary to have a neutralization of oxidized product.

The main function of soluble cutting oil is to keep cool the metal surface. Heat generated during metal cutting or metal to metal friction. Water acts as a coolant and oil act as a lubricant. Due to this water/oil emulsion is used. But water can cause rusting/corrosion. A suitable emulsion can reduce rusting. So, the sulfonate of Boffa and Anantaneni are not suitable for soluble cutting oil.

The use of heavy alkyl benzene as a lubricant in engine has no relation with the Applicants' present invention. The metalworking fluid has entirely different uses as compared to I.C.Engine lubricants.

Boffa '537 and Anantaneni '430 selected the application and developed the alkyl benzene overbased sulfonate and alkyl benzene sulfonate accordingly. In the Applicants' invention, which is a value addition to heavy alkylate, the selection of base material is fixed. Heavy alkylate is tailored to be suitable for soluble cutting oil. Synthesis of heavy alkylate is not my purpose. So, the Applicants' invention is different from Boffa and Anantaneni.

Tanaka U.S. Patent No. 6,245,725 is directed to the oiliness component in the detailed description all possible names of compounds including castor oil for oiliness are listed. Anantaneni mentioned (in detailed description) friction modifier including derivatives of coconut oil. Castor oil has a peculiar characteristic of non-solubility in oil and water. It is not clear from patents of Tanaka and Anantaneni that castor oil or other additives will be useful in oil-water emulsion also. They have discussed only for oil-soluble or single phase oil lubricants.

The amount of additive is not listed as an absolute quantity. It depends upon the nature of base oil and application needed. Base oil and additive composition of engine oil will not be

suitable for gear oil or cutting oil or greases. Additives and its amount will change with the needs, accordingly. The patents of Tanaka (US 6245725) and Anantaneni (US 6630430) are not teaching which additive and in what quantity will be needed for oil-water emulsion.

The present patent application is quite different from Camenzind U.S. Patent No. 7,026,438 on anti-oxidant (lll), antirust agent (lV) and coupling agent (V) because, as described in the abstract of Camenzind:

> The invention relates to liquid sulfur-containing antioxidants and to compositions comprising them. The novel lubricant compositions comprise the reaction product of a selected group of 5-tert-butyl-4-hydroxy-3-methyl (or tert-butyl) phenyl substituted carboxylic acid esters with thiodiethylene glycol and a mono-hydroxy alcohol with a carbon chain length higher than 4 C-atoms. The novel lubricant compositions are highly resistant to oxidative degradation and are capable of reducing the negative effects of deposits, such as black sludge, in motor combustion engines, particularly spark ignition internal combustion engines.

The base oil of the patent "a reaction product" is quite different from the base oil "heavy alkylate" of the Applicants' invention. The composition is for motor combustion engine and different from the subject application for soluble cutting oil. Anti-oxidant is restricted to liquid sulfur containing product, which is different from anti-oxidant of the subject application.

In the claims Camenzind '438 only relates to "liquid sulfur-containing antioxidants" and "reaction product of a selected group of 5-tert-butyl-4-hydroxy-3-methyl (or tert-butyl) phenyl substituted carboxylic acid esters with thiodiethylene glycol and a mono-hydroxy alcohol with a carbon chain length higher than 4 C-atoms." All antioxidants are not same and all lubricants are not same.

In column 7, line 60-66 it states that:

> The invention relates also to a method of improving the performance properties of lubricants, which comprises adding to the lubricant at least one product as defined above. The lubricant compositions, e.g. greases,

> gear fluids, metal working fluids and hydraulic fluids, may additionally contain further additives, which are added to improve further their performance properties. These include: other antioxidants, metal deactivators, rust inhibitors, viscosity index improvers, pour-point depressants, dispersants, detergents, high pressure additives and antiwear additives. Such additives are added in customary amounts, each in the range from 0.01 to 10.0% by weight.

All the additives mentioned here are suitable for the particular base oil that is the reaction product mentioned. These are not universal additives. The metalworking fluid described in this patent is also made from the same base oil. Camenzind does not teach that these additives will be suitable for heavy alkyl benzene (as lube base oil) based metalworking fluid and thus, does not render the Applicants' invention as obvious.

The present patent application is quite different from Van Dam, U.S. Patent No. 6,784,142 on fungicide (VI) because it discloses a lubricating composition for diesel engine. All the additives mentioned here are effective in oil phase and composition is suitable as a lubricant in a diesel engine. It is not clear that these additives are also suitable for water-oil emulsion phase. There is no indication that they will work.

The title is "Lubricating oil composition comprising borated and EC-treated succinimides and phenolic anti-oxidant". Here three components are essential parts that are hydrocarbon base-oil, borated succinimide and phenolic antioxidant. Other additional additives mentioned here are suitable in this combination. There is no teaching in this patent regarding what will happen if the composition is oil-water emulsion (base), sulfonate/oleate (emulsifier) and amine (anti-oxidant), the combination mentioned in the Applicants' invention.

Matsushita, U.S. Patent No. 5,741,763 is directed on extreme pressure additive (VII) to give a composition of a lubricating oil (for machines operation), which is easily separable if mixed into soluble cutting oil. This patent is not for composition of soluble cutting oil. This

lubricating oil is highly hydrophobic and will not mix with even oil-water emulsion. The wear preventive agent may be added to this composition. Matsushita does not teach the utility of any of the additives. The quantity of total additive is 0.01 to 5 wt % and dibenzyl disulfide is not specifically mentioned. Its suitability for soluble cutting oil emulsion is not indicated.

It is possible that Matsushita only worked for oil and sulfonate composition and as per the literature he has used "commercial additive pack". In his word "Within the limits not detrimental to the objective of the present invention, a wide variety of additives conventionally used in lubricant oils, such as antioxidants, wear preventive agents, friction adjusters, metal deactivators, extreme pressure agents, rust preventives, adhesion improving agents and the like, may be added to the lubricant oil composition of the present invention." (See subject application, para 21). Only he is quoting from the literature. Matsushita has not worked with additives. Thus, Matsushita does not render the Applicants' invention as obvious.

Zoch, U.S. Patent No. 3,902,868 is entitled "Fuel additive and method for improving combustion" and discloses the liquid additives in vapor phase for fuel of internal combustion engine to enhance the combustion. For this purpose he propose various oxygenate or oxygen carrying liquids. Alcohol, ketone, ester and ether are included in this category. These compounds will provide additional oxygen for combustion. In the subject application, iso-propyl and other alcohol is used but as a co-surfactant. This co-surfactant easily mixes with water to reduce oil water interfacial tension and helps the emulsifier in completing its action of providing stable oil-water emulsion. The emulsifier used here has more oil solubility than water solubility. In the patent of Zoch, alcohol is burnt in vapor phase but in the Applicants' invention, alcohol remains in the emulsion helps in emulsion stability and its formation. Ketone and ester will not be useful as co-surfactant. Zoch discloses fuel additives in vapor phase

while the Applicants' invention describes a lube additive containing soluble cutting oil, which has water-oil liquid phase and not used for combustion. This action is not described Zoch and thus renders the Applicants' invention as non-obvious.

Otaki, U.S. Patent No. 4,765,917 discloses water based lubricants on dies for metal forging. Forging means giving shape to molten metals on high temperature which may be in the thousands degree centigrade. At this temperature, dies may stick together and to avoid this some solid compounds are used. Water acts as a carrier here and after application it evaporates. Only salts go into action as solid layer on metals. In the Applicants' invention, for soluble cutting oil, the additives remain in emulsion phase and works at comparatively lower temperature around 60 to 80 degree centigrade. There is a significant difference between forging and cutting and media are also different. Additives composition for soluble cutting oil can not be guessed from the patent of Otaki '917.

Otaki has used large portions of water-soluble substance including extreme pressure additive (phosphates, calcium carbonates, tri-metal salt, etc) in water based lubricant. In the Applicants' case large portion of additives including extreme pressure additives are oil soluble or dispersible. The calcium carbonate in the Otaki patent acts as extreme pressure additive on high temperature to avoid fusion of both parts of dies. In the Applicants' invention the calcium carbonate is used to provide mild alkalinity to keep the pH of emulsion at 7 or neutral. It is required when oleate emulsifier is used. Acidity may cause dissociation of oleate soap and loss of emulsifying properties. Oleate as an emulsifier is preferred for further reduction of toxicity of the composition as oleate is less toxic than sulfonate. This aspect is not described in the Otaki patent. Thus, the Applicants' invention is not obvious in view of Otaki.

In the Applicants' invention it is clearly mentioned that the composition when mixed with water, an oil-water emulsion is obtained. This emulsion is suitable as "general purpose metalworking fluid". There are two types of metalworking fluid. NEAT and SOLUBLE OIL. Neat oil contains no water. Soluble cutting oil is an oil-water stable emulsion and contains large amount of water. Because, the subject invention relates to soluble cutting oil so it is written that the emulsion is suitable as general-purpose "metalworking fluid or soluble cutting oil". Previously, no one taught or disclosed the composition above i.e., soluble cutting oil from heavy alkylate. Heavy alkylate is a waste by-product during the manufacture of detergent class alkyl benzene (LAB). This invention is value addition to this heavy alkylate. The waste product has been tailored before utilization. Synthesis is not the aim. This technology will be beneficial to the LAB manufacturer. This invention is also beneficial for pollution control and reducing mist-health-hazard to operators because alkyl benzene is less toxic than mineral oil. These aspects of the Applicants' invention are not obvious in view of the prior art.

The Examiner has picked one small element from each of eight references. There is no suggestion or teaching to combine them. Additionally, even if they are combined as the Examiner states one still does not arrive at the Applicants' invention. The Examiner can not use hindsight to determine that if an element is selected from each of the cited references that the Applicants' invention is obvious. It is not obvious and in fact, the combination is not even suggested.

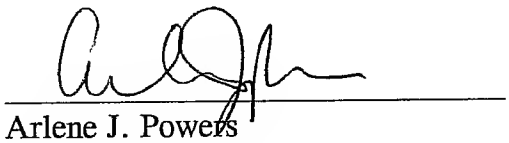
In view of the foregoing, the Applicants contend that the amended claim and the claims dependent there from are in proper form. Applicants also respectfully contend that the teachings of Anantaneni, U.S. Patent No. 6,630,430, in view of Boffa, U.S. Patent No. 5,804,537; Tanaka, U.S. Patent No. 6,245,725 B1; Camenzind, U.S. Patent No. 7,026,438 B2; Van Dam, U.S. Patent No. 6,784,142 B2; Matsushita, U.S. Patent No. 5,741,763; Zoch,

U.S. Patent No. 3,902,868; and Otaki, U.S. Patent No. 4,765,917 do not establish a *prima facie* case of obviousness under 35 U.S.C. §103(a). Thus, claims 1-34 are considered to be patently distinguishable over the prior art of record and should be allowed.

The application is now considered to be in condition for allowance, and an early indication of same is earnestly solicited.

The Commissioner is authorized to charge Deposit Order Account No. 19-0079 for any fees that may be required.

Respectfully submitted,



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